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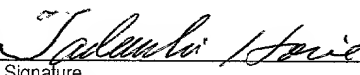
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FORM PTO-1390 (Rev. 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	CASE NO. 9683/69
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) 09/600429
INTERNATIONAL APPLICATION NO. PCT/JP99/07281	INTERNATIONAL FILING DATE December 24, 1999	PRIORITY DATE CLAIMED December 28, 1998	
TITLE OF INVENTION Communication Control Method, Communication Method, Server Apparatus, Terminal Device, Relay Apparatus and Communication System			
APPLICANT(S) FOR DO/EO/US Shigetaka Kurita et al.			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none">1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 3712. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 3713. <input type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)).<ol style="list-style-type: none">a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).<ol style="list-style-type: none">a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).b. <input type="checkbox"/> have been transmitted by the International Bureau.c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.d. <input checked="" type="checkbox"/> have not been made and will not be made.8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)) and/or amendments under Article 34.			
Items 11. to 16. Below concern other document(s) or information included:			
<ol style="list-style-type: none">11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.13. <input type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.14. <input type="checkbox"/> A substitute specification.15. <input type="checkbox"/> A change of power of attorney and/or address letter.16. <input checked="" type="checkbox"/> Other items or information: Power of Attorney			

U.S. APPLICATION NO. (If known, see 37 CFR 1.50) 09/600429		INTERNATIONAL APPLICATION NO. PCT/JP99/07281		CASE NO. 9683/69	
17. <input checked="" type="checkbox"/> The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO \$840.00 International preliminary examination fee paid to USPTO (37 CFR 1.492(2)(1)) \$670.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.492(a)(2)) \$760.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.492(a)(3)) paid to USPTO \$970.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$96.00 <div style="text-align: center; font-weight: bold; margin-top: 10px;">ENTER APPROPRIATE BASIC FEE AMOUNT</div>				CALCULATIONS	PTO USE ONLY
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).					
Claims	Number Filed	Number Extra	Rate		
Total Claims	21- 20 =	1	x \$ 18.00	18	
Independent Claims	12- 3 =	9	x \$ 78.00	702	
Multiple dependent claim(s) if Applicable)			1 + \$260.00	260	
TOTAL OF ABOVE CALCULATIONS =				\$980	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)					
SUBTOTAL =				\$1,820	
Surcharge of \$130.00 for furnishing the English translation later than the <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE=				\$1,820	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31), \$40.00 per property +				40	
TOTAL FEES ENCLOSED=				\$1,860	
				Amount to be refunded	\$
				charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of <u>\$1,860.00</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 23-1925 in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
Send All Correspondence to: Brinks Hofer Gilson & Lione P.O. Box 10395 Chicago, IL 60610			<div style="text-align: center; margin-top: 20px;">  Signature Tadashi Horie Name 40,437 Registration Number </div>		

COMMUNICATION CONTROL METHOD, COMMUNICATION METHOD, SERVER
APPARATUS, TERMINAL DEVICE, RELAY APPARATUS
AND COMMUNICATION SYSTEM

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BACKGROUND OF THE INVENTION

TECHNICAL FIELD

The present invention relates to a communication
10 control method, communication method, server apparatus,
terminal device, relay apparatus and communication system
suitable for use in an information distributing system
providing information from at least one server apparatus to
a plurality of user terminals via a network.

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BACKGROUND ART

The internet provides content providers with an
environment capable of providing content to users around
20 the world directly and at a low cost, and provides users an
environment enabling content from around the world to be
used in a standard user interface. Along with the
popularization of the internet, recent years have seen
active development, provision and use of content providing
25 services making use of the internet, and the vast amount of
content for various uses on the internet is increasing
daily. As a result, the ease of access to the internet has
become an important consideration in the development of
content distributing services.

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With the spread of the internet, transparent system
architectures employing internet technologies in LANs
(Local Area Networks) have become commonplace. Here, one
basic constituent of "internet technologies" is the

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communication protocol, specifically TCP/IP (Transmission Control Protocol / Internet Protocol). That is, a very large number of networks currently employ the TCP/IP.

Data communications according to TCP/IP are based on an OSI layer model (OSI Reference Model) wherein, on the transmission side, data is relayed by adding headers for each layer onto actual data from a higher layer to a lower layer, and packets are transmitted to the reception side. On the other hand, at the reception side, the transmitted packets are handed from the lowest physical layer in order to the highest layer. During this procedure, in each layer, packets supplied from a lower layer are separated into data and a header corresponding to that layer, the content of this header is analyzed, and the data is handed to a higher layer.

Here, the packet structure obtained by the processing in each layer on the transmission side shall be explained with reference to Figs. 12-14. However, it shall here be assumed that, as in general dial-up connections, the transmission side and reception side are connected one-to-one using a PPP (Point-to-Point Protocol).

Fig. 12 shows the structure of a TCP segment which is a packet that has undergone processing in the fourth layer. This TCP segment is composed of a TCP header and data. Here, the TCP header is composed of a basic header (20 bytes) and an optional header. The basic header includes information such as a source port number, destination port number, sequence number, acknowledgment number, code bits and window size. Additionally, the data is composed of actual data and a header added by means of processing of an upper layer equal to or higher than the session layer.

Fig. 13 shows the structure of an IP datagram which is a packet that has undergone processing in the third

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layer. This IP datagram is composed of an IP header and data. Here, the IP header is composed of a basic header (20 bytes) and an optional header. The basic header includes information such as a source IP address, a destination IP address, a service type, a packet length, and a protocol number. Additionally, the data is composed of actual data and a header of an upper layer (such as TCP, UDP (User Datagram Protocol) or ICMP (Internet Control Message Protocol)) including at least one layer equal to or higher than the transport layer.

Fig. 14 shows the structure of a PPP frame which is a packet that has undergone the processing of the second layer. The numbers in parentheses in the drawing are given in units of bytes. This PPP frame consists of a PPP header (5 bytes), data, and a PPP footer (3 or 5 bytes). Here, the PPP header is composed of various information such as a flag, address, control, packet protocol identifier (LCP (Link Control Protocol)), IPCP (Internet Protocol Control Protocol), IP or IPX (Internetwork Packet Exchange). Additionally, the data is composed of actual data and a header (including the above-mentioned TCP header and IP header) added by processing at a layer including at least one layer equal to or higher than the network layer. The PPP footer is composed of an FCS (Frame Check Sequence) and a flag. The MTU indicated in the drawing refers to the maximum transmission unit.

As described above, on the transmission side, the actual data to be transmitted is processed by procedures corresponding to each layer in the OSI layer model from the highest layer to the lowest layer, so that a header corresponding to the processing of each layer is sequentially added to the actual data.

In Fig. 7, 7A is a packet that has undergone all of

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Then, an IPCP set up request message or a negative

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data transmission side and the data reception side.

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exist.

First, with TCP/IP, as described above, the header of a packet is added by the layer and encapsulated, as a result of which the overall header size becomes
5 extraordinarily large, and particularly when the actual data size is small, the relative header size becomes large. For example, when transferring about 500 bytes of data during mobile communications, the header size comes to about ten percent of the data size, and there are fields
10 among the information contained in the header which are left absolutely unused in actuality.

Next, there is a problem in that the number of signals exchanged between the data transmission side and reception side is extremely large in the operating
15 sequences during establishment of connections prior to actually transmitting the data. In the example shown in Fig. 15, a total of 14 steps from step S1 to S14 are required. Consequently, as the number of users accessing the network increases, the traffic increases dramatically
20 and the data transfer rate drops.

Additionally, since the user is charged for the operations (steps S1-S14) prior to data transmission and reception, the economic burden on the user side becomes large.

25 Although these problems also occur in connections to the internet via fixed networks, they are especially serious problems in mobile communications wherein the data transmission ability is low in comparison to communications via fixed networks.

30 Additionally, since the TCP/IP is too heavy, it makes the mobile terminals having the ability to rapidly process the TCP/IP larger, heavier, and more expensive than the mobile station, when installing devices with the ability to

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process data to the level of mobile stations. Currently, the large, heavy and expensive mobile terminals which simply integrate a portable computer with a mobile station are received well only in small markets. In contrast, 5 mobile stations are designed with portability, operability and ease of obtainment in mind, and the form and price of mobile stations are believed to be already well-received in an extremely broad market due to their general usefulness and high degree of popularity. Additionally, as mentioned 10 above, various types of content capable of responding to the needs of various users already exist on the internet, and due to the steady increase in the amount of content even now, devices which are capable of being accepted by various users are desired as devices for accessing the 15 internet. Keeping these matters in mind, there is little probability that services for accessing the internet using mobile terminals having the ability to rapidly process TCP/IP will be well-received in a wide market, even without taking into consideration the problem of data transmission 20 ability in mobile communications.

Of course, one might consider having the content providing side develop content which is customized to the data processing power of mobile stations or the data transmission ability of mobile communications, but this 25 type of development of customized content requires a heavy burden of the content providing side, and it is predicted that only a small amount of content with uses that are restricted as compared to the internet will be able to be provided to the user. That is, it is believed that this 30 type of experiment would only be well-received in a small market.

From the above description, it is believed that the foundation of mobile data distribution is in the

combination of mobile stations with the internet, and in order to achieve this combination, it is necessary to develop efficient communication technologies which enable users to stresslessly use content from the internet using
5 mobile stations.

SUMMARY OF THE INVENTION

The present invention has been made in view of the
10 above-mentioned problems, and has the object of providing a communication control method, communication method, server apparatus, terminal device, relay apparatus and communication system capable of efficiently performing data communications even when the data processing ability and
15 transmission ability are not high such as in mobile stations.

In order to achieve the above purpose, a communication control method recited in claim 1 is a communication control method in a relay apparatus for
20 relaying data communications between a server apparatus and a user terminal, comprising a step of receiving a packet containing a message requesting establishment of a connection with the server apparatus and an identification number for the connection sent from the user terminal
25 according to a first communication protocol which is a protocol; a step of transmitting a packet containing an acknowledgment response message that the packet has been received to the user terminal according to the first communication protocol, and establishing a connection
30 between the server apparatus and itself according to a second communication protocol; a step of receiving a packet containing a data transfer request message transmitted from the user terminal to the server apparatus according to the

30 Additionally, a communication control method recited in claim 2 is a communication control method in a relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising a step of receiving a packet containing a message requesting

30 Additionally, a communication control method recited in claim 2 is a communication control method in a relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising a step of receiving a packet containing a message requesting

establishment of a connection to the server apparatus, an identification number for the connection and a data transfer request message for the server apparatus transmitted from the user terminal according to a first communication protocol; a step of transmitting a packet containing an acknowledgment response message that the packet has been received to the user terminal according to the first communication protocol, establishing a connection between the server apparatus and itself according to a second communication protocol, and transmitting a packet containing the data transfer request message to the server apparatus; and a step of receiving data transmitted from the server apparatus according to the second communication protocol and transmitting a packet containing this data to the user terminal according to the first communication protocol. Here, the first communication protocol is simpler than the second communication protocol.

According to this communication control method, it is possible to include a connection establishment request to the server apparatus and a data transfer request in a single signal from the user terminal to the relay apparatus. As a result, according to this communication control method, the traffic between the user terminal and relay apparatus can be reduced and data transfer requests can be sent out without waiting for acknowledgment response messages from the relay apparatus at the user terminal, in addition to the effects of the invention recited in claim 1.

A communication control method recited in claim 3 is a communication control method according to claim 1 or 2, wherein the number of signals used in establishing the connection between the user terminal and the relay apparatus according to the first communication protocol is

less than the number of signals used in establishing the connection between the relay apparatus and the server apparatus according to the second communication protocol.

According to this communication control method, it is possible to reliably reduce the number of signals exchanged by the user terminal when establishing a connection, in addition to the effects due to the invention recited in claim 1 or 2.

A communication control method recited in claim 4 is a communication control method according to claim 1 or 2, wherein a communication interval between the user terminal and the relay apparatus is composed of a radio-oriented interval, and a communication interval between the relay apparatus and the server apparatus is composed of a wire-oriented interval.

According to this communication control method, communications by a communication protocol simpler than the communication protocol in a wired interval are performed in a radio interval which generally has a lower data transmission capacity than the wired interval. Therefore, according to this communication control method, the effect of being able to achieve communications suited to the data transmission capabilities of each interval is obtained in addition to the effects according to the invention recited in claim 1 or 2.

A communication method recited in claim 5 is a communication method for performing data communications between a server apparatus and a user terminal, wherein a communication control procedure in an upper layer containing a transport layer in the data communications comprises a first step of transmitting a first packet containing a message requesting establishment of a connection and an identification number for the connection

from the user terminal to the server apparatus; a second step of transmitting a second packet containing an acknowledgment response message that this first packet has been received from the server apparatus to the user terminal; and a third step of transmitting a third packet containing actual data to the user terminal by designating the identification number from the server apparatus after the connection has been established between the user terminal and the server apparatus.

10 According to this communication method, a connection is established between the user terminal and server apparatus by a communication control procedure of an upper layer containing a transport layer, and the transmission of packets containing actual data is performed through this connection. Consequently, according to this communication method, at least one of the following is achieved on the user terminal side: a reduction of the header in the packets, a reduction of number of signals exchanged and a reduction of processing, thereby enabling the load on the user terminal side to be lightened.

Here, the reduction of the load on the user terminal side shall be explained in detail.

For example, a case where the user terminal and server apparatus commence communications using TCP/IP and PPP shall be assumed. In this case, there are the following problems.

1. Since the communication protocols of each layer are for general use, the proportion of actual data contained in the transmitted data is extremely small due to encapsulating in the layers.

2. Since establishment procedures are performed for each layer when establishing a connection, a large number of signals must be exchanged, thus increasing traffic and

causing a great load on the user terminal.

3. At the user terminal, data encapsulating and decapsulating procedures are performed over multiple stages, thus causing a great load on the user terminal.

5 In contrast, by transmitting packets containing
actual data through connections established by the
communication control procedures of the upper layers
containing the transport layer as in this communication
method, it is possible to resolve at least one of the above
10 problems.

Additionally, a communication method recited in claim 6 is a communication method for performing data communications between a user terminal and a relay apparatus for relaying data communications between the user terminal and a server apparatus, wherein communication control procedure in an upper layer containing a transport layer in the data communications comprises a first step of transmitting a first packet containing a message requesting establishment of a connection and an identification number for the connection from the user terminal to the relay apparatus; a second step of transmitting a second packet containing an acknowledgment response message that this first packet has been received from the relay apparatus to the user terminal; and a third step of transmitting a third packet containing actual data supplied to the relay apparatus according to a predetermined protocol from the server apparatus to the user terminal by designating the identification number after the connection has been established between the user terminal and the relay apparatus.

According to this communication method, a connection is established between the user terminal and relay apparatus by communication control procedures of upper

layers including the transport layer, and packets containing actual data from the server apparatus are transmitted from the relay apparatus to the user terminal through this connection. Consequently, according to this communication method, the same effects as those of the invention recited in claim 5 are obtained. Additionally, according to this communication method, the connection is established between the user terminal and the relay apparatus, thereby shortening the time until an acknowledgment response message is received at the user terminal in comparison to the case where one is established between the user terminal and server apparatus.

Also, a communication method recited in claim 7 is a communication method according to claim 5, wherein in the first step, the user terminal transmits data size information indicating the maximum size of data that it is capable of receiving at once to the server apparatus; and the server apparatus obtains the maximum size from the data size information which has been received, and divides the actual data for transmission to the user terminal if the size of the third packet exceeds the maximum size.

According to this communication method, it is possible to avoid situations where the server apparatus sends the user terminal packets of a size which cannot be received at once by the user terminal, in addition to the effects due to the invention recited in claim 5.

Furthermore, a communication method recited in claim 8 is a communication method according to claim 6, wherein in the first step, the user terminal transmits data size information indicating the maximum size of data that it is capable of receiving at once to the relay apparatus; and the relay apparatus obtains the maximum size from the data size information which has been received, and divides the

According to this communication method, it is possible to avoid situations where the relay apparatus sends the user terminal packets of a size which cannot be received at once by the user terminal, in addition to the effects due to the invention recited in claim 6.

A server apparatus recited in claim 9 is a server apparatus for performing data communications with a user terminal, comprising communication control means for performing communication control at an upper layer level containing a transport layer when performing the data communications; the communication control means comprising means for receiving a first packet containing a message requesting establishment of a connection and an identification number for the connection transmitted from the user terminal; means for transmitting a second packet containing an acknowledgment response message that this first packet has been received to the user terminal; and means for transmitting a third packet containing actual data to the user terminal by designating the identification number after the connection has been established with the user terminal.

According to this server apparatus, communication control is performed at an upper layer level containing the transport layer. With this communication control, a connection is established between the server apparatus and the user terminal, and packets containing actual data are transmitted from the server apparatus to the user terminal via this connection. Consequently, this server apparatus is able to obtain the same effects as the effects due to the invention recited in claim 5.

A relay apparatus recited in claim 10 is a relay

According to this relay apparatus, communication control is performed at the upper layer level containing the transport layer. With this communication control, a connection is established between the relay apparatus and the user terminal, and packets containing actual data from the server apparatus are transmitted from the relay apparatus to the user terminal through this connection. Consequently, this relay apparatus is able to obtain the same effects as the effects due to the invention recited in claim 6.

Additionally, a relay apparatus recited in claim 11 is a relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising means for receiving a packet containing a message requesting establishment of a connection with the server apparatus and an identification number for the connection

transmitted from the user terminal according to a first communication protocol; means for transmitting a packet containing an acknowledgment response message that the packet has been received to the user terminal according to the first communication protocol, and establishing a connection between the server apparatus and itself according to a second communication protocol; means for receiving a packet containing a data transfer request message transmitted from the user terminal to the server apparatus according to the first communication protocol, and transmitting a packet containing this data transfer request message to the server apparatus according to the second communication protocol; and means for receiving data transmitted from the server apparatus according to the second communication protocol and transmitting a packet containing this data to the user terminal according to the first communication protocol; wherein the first communication protocol is simpler than the second communication protocol.

According to this relay apparatus, a conversion is made between a communication protocol with a server apparatus and a communication protocol with a user terminal which is simpler than this communication protocol when relaying client/server type data communications between a user terminal and a server apparatus. Consequently, this relay apparatus able to obtain the same effects as the invention recited in claim 1.

Furthermore, a relay apparatus recited in claim 12 is a relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising means for receiving a packet containing a message requesting establishment of a connection to the server apparatus, an identification number for the connection and a data

transfer request message for the server apparatus transmitted from the user terminal according to a first communication protocol; means for transmitting a packet containing an acknowledgment response message that the packet has been received to the user terminal according to the first communication protocol, establishing a connection between the server apparatus and itself according to a second communication protocol, and transmitting a packet containing the data transfer request message to the server apparatus; and means for receiving data transmitted from the server apparatus according to the second communication protocol and transmitting a packet containing this data to the user terminal according to the first communication protocol; wherein the first communication protocol is simpler than the second communication protocol.

According to this relay apparatus, it is possible to include a connection establishment request to the server apparatus and a data transfer request in a single signal from the user terminal to the relay apparatus. Therefore, this relay apparatus is capable of obtaining the same effects as the effects of the invention recited in claim 2.

A relay apparatus recited in claim 13 is a relay apparatus according claim 11 or 12, wherein the number of signals used in establishing the connection between the user terminal and the relay apparatus according to the first communication protocol is less than the number of signals used in establishing the connection between the relay apparatus and the server apparatus according to the second communication protocol.

According to this relay apparatus, the number of signals exchanged at the user terminal when establishing a connection can be reliably reduced in addition to the effects of the invention recited in claim 11 or 12.

A relay apparatus recited in claim 14 is a relay apparatus according to any one of claims 10-12, wherein a communication interval between the user terminal and the relay apparatus is composed of a radio-oriented interval, and a communication interval between the relay apparatus and the server apparatus is composed of a wire-oriented interval.

According to this relay apparatus, the communication procedures in a radio interval which generally has a lower data transmission capacity than a wired interval is reduced to less than the communication processes in the wired interval. Consequently, according to this relay apparatus, the effect of being able to achieve communications suited to the data transmission capabilities of each interval is obtained in addition to the effects according to any one of claims 10-12.

A communication system recited in claim 15 is characterized in that a user terminal and a server apparatus are connected via a relay apparatus according to any one of claims 10-12.

According to this communication system, the same effects as the effects of any one of claims 10-12 can be obtained.

A terminal device recited in claim 16 is a terminal device for performing data communications with a server apparatus, comprising communication control means for performing communication control on an upper layer level containing a transport layer when performing the data communications; the communication control means comprising means for transmitting a first packet containing a message requesting establishment of a connection and an identification number for the connection; means for receiving a second packet containing an acknowledgment

The terminal device recited in claim 17 is a terminal device for performing data communications with a server apparatus via a relay apparatus for managing a connection with the terminal device, comprising communication control means for performing communication control on an upper layer level containing a transport layer when performing the data communications; the communication control means comprising means for transmitting a first packet containing a message requesting establishment of a connection with the relay apparatus and an identification number for the connection; means for receiving a second packet containing an acknowledgment response message that the first packet has been received transmitted from the relay apparatus; and means for receiving a third packet containing actual data supplied from the server apparatus to the relay apparatus according to a predetermined protocol and transmitted from the relay apparatus by designating the identification number after the connection has been established between

According to this terminal device, it is possible to include a connection establishment request to the server apparatus and a data transfer request in a single signal from the user terminal to the relay apparatus. Therefore, 30 this terminal device is able to obtain the same effects as the invention recited in claim 2.

A terminal device recited in claim 20 is a terminal device according to claim 18 or 19, wherein the number of

signals used in establishing the connection between the user terminal and the relay apparatus according to the first communication protocol is less than the number of signals used in establishing the connection between the relay apparatus and the server apparatus according to the second communication protocol.

According to this terminal device, it is possible to reliably reduce the number of signals exchanged when establishing a connection in addition to the effects of the invention recited in claim 18 or 19.

A terminal device recited in claim 21 is a terminal device according to any one of claims 17-19, wherein a communication interval between the user terminal and the relay apparatus is composed of a radio-oriented interval, and a communication interval between the relay apparatus and the server apparatus is composed of a wire-oriented interval.

According to this terminal device, the communications procedures in a radio interval which generally has a lower data transmission capacity than a wired interval are reduced to less than the communication procedures in the wired interval. Therefore, according to this terminal device, it is possible to achieve communications suited to the data transmission capabilities of each interval in addition to the effects of any of claims 17-19.

In summary of the above, the present invention makes the header size smaller in order to reduce the amount of data transferred and reduces the number of signals at channel connection by employing a simplified protocol when performing data communications between a server apparatus and a user terminal, thereby lightening the traffic and reducing overhead, and improving the response of data communications. Therefore, it enables the comfortable use

of internet content using devices having roughly the data processing capabilities of a mobile device and through a communication channel having a low data transmission capacity.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing the structure of a communication system according to an embodiment of the present invention.

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Fig. 2 is a diagram showing a protocol structure of the same communication system.

Fig. 3 is a diagram showing another protocol structure of the same communication system.

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Fig. 4 is a diagram showing the operating sequence prior to packet communications in the same communication system.

Fig. 5 is a diagram showing the operating sequence during packet communications in the same communication system.

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Fig. 6 is a diagram showing the operating sequence after packet communications in the same communication system.

Fig. 7 is a diagram comparing the structure of a packet transmitted in TCP/IP communications and the structure of a packet transmitted according to a simplified protocol in the same embodiment.

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Fig. 8 is a diagram showing the structure of a packet transmitted in a connection set up request in the same embodiment.

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Fig. 9 is a diagram showing the structure of a packet transmitted in acknowledgment response to a connection set up request in the same embodiment.

Fig. 10 is a diagram showing the structure of a packet transmitted during data transmission and reception in the same embodiment, showing the structure of a packet containing actual data and the structure of a packet transmitted in acknowledgment response when a packet containing actual data has been transmitted.

Fig. 11 is a diagram showing an example of the outward appearance of a mobile station contained in the same communication system and a screen of an information display portion when the mobile station is providing the user with information.

Fig. 12 is a diagram showing the format of a TCP segment.

Fig. 13 is a diagram showing the format of an IP datagram.

Fig. 14 is a diagram showing the format of a PPP frame.

Fig. 15 is a diagram showing an operating sequence for the case in which data communications are performed using TCP/IP.

Fig. 16 is a diagram showing the structure of a communication system according to a modification example of the same embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferable mode for carrying out the present invention shall be described in detail with reference to the attached drawings.

1. Structure of Embodiment

1.1. System Structure

Fig. 1 shows the structure of a communication network system of the present embodiment.

This communication network system comprises MS (Mobile Station) 1, BS (Base Station) 2, PPM (Packet Processing Module) 3, GWS (GateWay Server) 5, CPS (Content Provider Server) 8 connected to GWS 5 via the internet 6 or a dedicated line 7 and M-SCP (Mobile Service Control Point) 9.

BS 2, PPM 3, GWS 5, M-SCP 9 and the communication lines for connecting these form a mobile packet network 10.

MS 1 is a terminal device which receives packet communication services of the mobile packet communication network 10. In addition to being connected to the mobile packet communication network 10 shown in Fig. 1, the MS 1 is connected to a mobile telephone network which is not shown, whereby it is capable of receiving a mobile telephone service.

Fig. 11 shows an example of the outward appearance of the MS 1 and a screen displayed on the MS 1. The MS 1 has an audio input/output portion for the user to perform audio communications, a radio portion for performing radio communications with BS 2 (neither are shown), an information display portion 1a comprising a liquid crystal panel or the like, an operating portion 1b for performing information input operations such as number entry or character input, and an internal microcomputer for controlling these portions. Additionally, MS 1 contains software for viewing document data (a so-called browser). This browser is software for displaying a dialog screen based on data in HTML format (hereafter referred to as HTML data) supplied from the CPS 8 possessed by a content providing business via the mobile packet communication network 10.

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zones which divide the ground e.g. into areas having a

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The M-SCP 9 manages subscriber information and performs processing relating to packet registration when packet communications begin as shall be explained, and packet deregistration when packet communications end.

1.2. Protocol Structure

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1.2.1. First Layer (Physical Layer)

In Figs. 2 and 3, L1 indicates a physical layer.

In the physical layer protocol of the wire-oriented interval, the used frequencies, transmission power, modulation method, access method and the like are defined in order to ensure that the transmission of bit sequences
5 is performed using communication lines composed of physical media such as dedicated lines, public telephone lines or ISDN.

On the other hand, in the physical layer protocol of the radio-oriented interval, the packet communication
10 channels are defined on the basis of the channel structure of the PDC system, and in particular, the arrangement/structure of physical channels for packet communication and the signal coding method and signal transmission method for transmitting signals using the
15 physical channels for packet communication are defined.

1.2.2. Second Layer (Data Link Layer)

In Figs. 2 and 3, L2 indicates a data link layer.

In the data link layer protocol of the wire-oriented interval, the procedures and interface for performing
20 transparent and highly reliable data transmissions between nodes are defined using bit sequence transmission functions provided in the physical layer. Data links are established using PPP as the protocol of this data link layer.

On the other hand, in the data link layer of the
25 radio-oriented interval, LAPDM (Link Access Procedure for Digital Mobile channel) is used between the MS 1 and PPM 3. This LAPDM is one used for physical control channels and physical communication channels with functions added to perform packet communications efficiently so as to enable
30 use on physical channels for packet communications. Furthermore, in the case of Fig. 3, an LAPB (Link Access Procedure Balanced) is used between the MS 1 and the external device 11.

1.2.5. Fifth Layer (Session Layer)

Between the MS 1 and GWS 5, communications are performed using HTTP by means of a virtual circuit to be explained below. Additionally, in the application layer, data communications are performed between the MS 1 having a browser and the CPS 8 possessing data of various formats such as plain text, HTML, GIF, and the like.

Between the MS 1 and GWS 5, the sixth layer is composed of HTTP as an internetwork-dedicated protocol, between the GWS 5 and CPS 8, it is composed of HTTP/SMTP.

1.2.7. Seventh Layer (Application Layer)

The application layer of the MS 1 is composed of a browser having the function of internet browsing software, and the application layer of the CPS 8 which provides the user of the MS 1 with various information is composed of data such as plain text, HTML, GIF, and the like.

2. Operation of the Embodiment

The overall operating sequence of a communication system including the wire-oriented interval and radio-oriented interval employing a protocol structure of this type shall be explained for the case of performing packet communications. In the following description, the structures of the packets exchanged in the radio-oriented intervals shall be referred to as the occasion demands.

2.1. Operating Sequence for Packet Registration

When a user presses the "information" key in MS 1, the operating sequence for packet registration shown in Fig. 4 is executed.

First, a packet communication registration request is issued from the MS 1 side toward the PPM 3 (S100). Upon receiving this, the PPM 3 sends the GWS 5 a signal requesting readout of packet origination information indicating whether or not the packet originator is a packet subscriber (S101). This packet origination information readout request signal is transmitted through the GWS 5 to the M-SCP 9 (S102).

The M-SCP 9 searches for subscriber information corresponding to the originator ID contained in the packet origination information readout request signal to determine whether or not the user of MS 1 is a packet service subscriber, and sends out a packet origination information

readout response signal (S103). Then, this packet origination information readout response signal is transmitted through the GWS 5 to the PPM 3 (S104).

Upon receiving this, the PPM 3 sends the MS 1 a packet identification request signal (S105). A response signal with respect to this packet identification request signal is returned from the MS 1 to the PPM 3 (S106).

Next, a packet communication registration request signal requesting registration of packet communications is transmitted from the PPM 3 through the GWS 5 to the M-SCP 9 (S107→ S108). The M-SCP 9 performs registration for initiating packet communication between the MS 1 and the radio transmission system, and returns a packet communication registration response signal to the GWS 5 (S109). Then, this packet communication registration request signal is transmitted from the GWS 5 to the PPM 3 (S110).

Upon receiving this packet communication registration response signal, the PPM 3 sends a channel connection request signal requesting channel connection to the GWS 5 (S111). Receiving this, the GWS 5 sends a channel connection request signal to the CPS 8 (S112), and the CPS 8 returns a channel connection response signal (S113).

Upon receiving the channel connection response signal, the GWS 5 sends the PPM 3 a channel connection request signal (S114), and the PPM 3 sends the MS 1 a packet communication registration response signal (S115).

2.2. Operating Sequence during Packet Communications

When this sequence of packet communication registration procedures ends, an initial screen such as shown in the previously mentioned Fig. 11 is shown in the information display portion 1a of MS 1. Then, when the

00276-01-000000

user operates a jog dial key 1c and selects a menu number from the initial screen, packet communications are commenced to display the content of the homepage at the URL linked to that number on the information display portion 1a.

Fig. 5 shows the operating sequence during packet communications.

First, the MS 1 sends out a packet (TL-OpenReq packet; "first packet" in the claims) containing a connection setup request message (Open Request), the URL of the homepage which is to be accessed, and an HTTP-Get method requesting transfer of the data required to display the content of the homepage on the information display portion 1a of the MS 1 (S200).

Fig. 8 shows the structure of the TL-OpenReq packet sent when requesting connection setup. In this packet, the field indicating the type of message contains information indicating that the message type is an "Open Request" message, and the field for data contains data for the HTTP-Get method including the above-mentioned URL. The logical number field contains identification numbers for identifying the end-to-end connection established between the MS 1 and GWS 5. The simplified protocol TL in the radio-oriented interval enables a plurality of simultaneous logical connections, each logical connection being identified by means of this logical number. This logical number is set on the mobile station side.

Additionally, the field indicating communication parameters contains the data length and the number of units of data capable of being received at once by the MS 1, as well as information such as timer values for the case where retransmission is to be performed. That is, the MS 1 houses information relating to its own capabilities in the

That is, on the network side, a logical connection setup request message is received, the communication parameter information for the MS 1 side is analyzed, and the communication parameters at logical connection setup are determined and sent out together with the acknowledgment response message (Open Acknowledge).

Then, a logical connection is established between the MS 1 and the GWS 5 by means of these operations, and the exchange of packet data is completed.

Then, this TL-OpenAck packet is transferred to the mobile station side (S205), and the TCP acknowledgment response packet is transferred from the PPM 3 to the GWS 5

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type of connection termination process is performed.

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5 Next, a packet (TL-DATA packet) containing data from
the homepage in CPS 8 supplied to the GWS 5 is transferred
to the PPM 3 (S217).

A TCP acknowledgment response packet indicating that this packet has been received is returned from the PPM 3 to the GWS 5 (S218). Then, the TL-DATA packet transferred to the PPM 3 is transferred to the MS 1 (S219). As a result, data from the homepage designated by the user is transferred to the MS 1, and the content corresponding to the number selected from the initial screen by the user is displayed on the information display portion 1a.

In Fig. 10, this packet is shown as packet 10B, and
25 its structure is shown. In this packet 10B, the field
indicating the message type contains information indicating
that the message type is "Data Acknowledge".

While the example explained above is one wherein data transfer ends after a single packet transfer from the CPS 8

to the MS 1, in actual practice, the sequences between the PPM 3 and GWS 5 (S217, S218, S221, S222) and the sequences between the MS 1 and PPM 3 (S219, S220) are repeatedly performed in accordance with the amount of data supplied
5 from the CPS 8. That is, if the amount of data supplied from the CPS 8 is 3 times the maximum amount of data capable of being received at once on the MS 1 side, then the data is transferred to the MS 1 side in 3 divisions, and the processes of steps S217, S218, S221 and S222, and
10 steps S219 and S220 are performed 3 times.

2.3. Operating Sequence at Packet Communication Termination

Fig. 6 shows the operating sequence at the time of
15 packet communication termination.

First, a signal which requests deregistration from packet communications is transmitted from the MS 1, through the PPM 3 and GWS 5 to the M-SCP 9 (S300 → S301 → S302). The M-SCP 9 deregisters MS 1 from packet communications,
20 and sends a packet communication deregistration signal (S303). This packet communication deregistration signal is transmitted via the GWS 5 and PPM 3 to the MS 1 (S304 → S305), and upon receiving it, the MS 1 sends the PPM 3 a response signal with respect to the packet communications
25 deregistration signal (S306).

Next, the PPM 3 sends the GWS 5 a signal requesting disconnection of the channel (S307), and the GWS 5 sends the CPS 8 the channel disconnection request signal (S308). Upon receiving this, the CPS 8 sends the GWS 5 a channel
30 disconnection response signal (S309), and the GWS 5 sends the PPM 3 a channel disconnection response signal (S310), thus ending the sequence performed at packet communications termination.

00276/3026

3. Effects of the Embodiment

(1) In this way, by comparing the conventional sequence using PPP, IP and TCP shown in Fig. 15 with the sequence using TL between the MS 1 and GWS 5 shown in Fig. 5 of the present embodiment, it is possible to largely reduce (to about 1/3) the number of signals exchanged between the transmitting side and the receiving side, and to smoothly perform data communications even if the hardware specs (CPU processing power, memory capacity, etc.) of the MS 1 are not very high.

(2) Additionally, as shown in Fig. 7, the structure of the packet 7B transferred in the present embodiment is considerably simplified. That is, in communications by the simplified protocol TL, each packet is composed of a header of approximately 10 bytes (called the TL header) and application data (e.g. 500 bytes, expandable to a maximum of 1400 bytes). Consequently, the header size is largely reduced (to about 1/5) in comparison to convention packets 7A using TCP/IP. As a result, the amount of transferred data is reduced and the communication cost is also lowered.

4. Examples of Modifications

The present invention is not restricted to the above-described embodiment, and various modifications such as the examples given below are possible.

(1) While data communications downstream with respect to the network was described in the present embodiment from the viewpoint of the user of a mobile station receiving data distributions from a CP server, it is also possible to transfer data according to the communication protocol (TL) described in the present embodiment in data communications upstream. That is, data communications by TL are possible

10 (3) The structure of the packets and content of the
information elements described in the present embodiment
are only examples, and may be of any type which allows the
header size to be made smaller and enables smooth data
communications between the user terminal and the relay
15 apparatus.

(5) The GWS 5 can be composed of a plurality of devices, such as to spread the load and traffic on the GWS 5. For example, as shown in Fig. 16, it can be separated into an M-PGW (Mobile Message-Packet Gateway Module) 11 and a GWS 13, such that the GWS 13 performs relay processes between the mobile packet communications network 10 and external communication paths, and the M-PGW 12 performs other processes. Additionally, it is possible to provide a plurality of M-PGW 11 and connect each M-PGW 11 to the GWS 13, so as to spread the load and traffic on each M-PGW.

CLAIMS

1. A communication control method in a relay apparatus
for relaying data communications between a server apparatus
5 and a user terminal, comprising:

a step of receiving a packet containing a message
requesting establishment of a connection with the server
apparatus and an identification number for the connection
sent from the user terminal according to a first
10 communication protocol which is a protocol;

a step of transmitting a packet containing an
acknowledgment response message that the packet has been
received to the user terminal according to the first
communication protocol, and establishing a connection
15 between the server apparatus and itself according to a
second communication protocol;

a step of receiving a packet containing a data
transfer request message transmitted from the user terminal
to the server apparatus according to the first
20 communication protocol, and transmitting a packet
containing this data transfer request message to the server
apparatus according to the second communication protocol;
and

a step of receiving data transmitted from the server
25 apparatus according to the second communication protocol
and transmitting a packet containing this data to the user
terminal according to the first communication protocol;

wherein the first communication protocol is simpler
than the second communication protocol.

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2. A communication control method in a relay apparatus
for relaying data communications between a server apparatus
and a user terminal, comprising:

15 a step of receiving data transmitted from the server
apparatus according to the second communication protocol
and transmitting a packet containing this data to the user
terminal according to the first communication protocol;

3. A communication control method according to claim 1 or 2, wherein the number of signals used in establishing the connection between the user terminal and the relay apparatus according to the first communication protocol is less than the number of signals used in establishing the connection between the relay apparatus and the server apparatus according to the second communication protocol.

30 4. A communication control method according to claim 1 or 2, wherein a communication interval between the user terminal and the relay apparatus is composed of a radio-oriented interval, and a communication interval between the

relay apparatus and the server apparatus is composed of a wire-oriented interval.

5. A communication method for performing data communications between a server apparatus and a user terminal, wherein communication control procedure in an upper layer containing a transport layer in the data communications comprises:

a first step of transmitting a first packet containing a message requesting establishment of a connection and an identification number for the connection from the user terminal to the server apparatus;

a second step of transmitting a second packet containing an acknowledgment response message that this first packet has been received from the server apparatus to the user terminal; and

a third step of transmitting a third packet containing actual data to the user terminal by designating the identification number from the server apparatus after the connection has been established between the user terminal and the server apparatus.

6. A communication method for performing data communications between a user terminal and a relay apparatus for relaying data communications between the user terminal and a server apparatus, wherein communication control procedure in an upper layer containing a transport layer in the data communications comprises:

a first step of transmitting a first packet containing a message requesting establishment of a connection and an identification number for the connection from the user terminal to the relay apparatus;

a second step of transmitting a second packet

00276-071200

5 the communication control means comprising:

10 means for transmitting a second packet containing an acknowledgment response message that this first packet has been received to the user terminal; and

10. A relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising:

the communication control means comprising:

means for transmitting a second packet containing an acknowledgment response message that this first packet has

means for transmitting a third packet containing
 1 data supplied from the server apparatus to the relay
 2 status according to a predetermined protocol to the user

terminal by designating the identification number after the connection has been established between the user terminal and itself.

- 5 11. A relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising:
- means for receiving a packet containing a message requesting establishment of a connection with the server apparatus and an identification number for the connection
- 10 transmitted from the user terminal according to a first communication protocol;
- means for transmitting a packet containing an acknowledgment response message that the packet has been received to the user terminal according to the first
- 15 communication protocol, and establishing a connection between the server apparatus and itself according to a second communication protocol;
- means for receiving a packet containing a data transfer request message transmitted from the user terminal
- 20 to the server apparatus according to the first communication protocol, and transmitting a packet containing this data transfer request message to the server apparatus according to the second communication protocol; and
- 25 means for receiving data transmitted from the server apparatus according to the second communication protocol and transmitting a packet containing this data to the user terminal according to the first communication protocol;
- wherein the first communication protocol is simpler
- 30 than the second communication protocol.

12. A relay apparatus for relaying data communications between a server apparatus and a user terminal, comprising:

relay apparatus and an identification number for the connection;

means for receiving a second packet containing an acknowledgment response message that the first packet has
5 been received transmitted from the relay apparatus; and

means for receiving a third packet containing actual data supplied from the server apparatus to the relay apparatus according to a predetermined protocol and transmitted from the relay apparatus by designating the
10 identification number after the connection has been established between the relay apparatus and itself.

18. A terminal device for performing data communications with a server apparatus via a relay apparatus for managing
15 a connection with the terminal device, comprising:

means for transmitting a packet containing a message requesting establishment of a connection with the server apparatus and an identification number for the connection according to a first communication protocol;

20 means for receiving a packet containing an acknowledgment response message that the packet has been received transmitted from the relay apparatus according to the first communication protocol;

means for transmitting a packet containing a data transfer request message to the server apparatus according
25 to the first communication protocol; and

means for receiving according to the first communication protocol a packet containing actual data supplied from the server apparatus to the relay apparatus
30 according to a second communication protocol in response to the data transfer request message;

wherein the first communication protocol is simpler than the second communication protocol.

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ABSTRACT OF THE DISCLOSURE

The present invention has the purpose of providing technology capable of efficiently transmitting data when
5 performing data communications between a mobile station and a server apparatus.

In the present invention, a simplified protocol TL is employed on the transport layer instead of TCP/IP as the communication protocol on the radio-oriented interval
10 between an MS (Mobile Station) 1 and a GWS (GateWay Server) 5 which relays data communications between the MS 1 and CPS (Content Provider Server). Additionally, the headers of the packets for data transfer according to TL are made up of about 10 bytes. By doing so, the traffic between the MS
15 1 and GWS 5 is decreased and the overhead is reduced in comparison to when TCP/IP is employed, thus improving the response of the data communications. As a result, the user can comfortably access contents provided by the CPS 8 on the internet via a radio-oriented interval which has a low
20 data transmission capacity in comparison to a wire-oriented interval using an MS 1 which has insufficient data processing power to employ TCP/IP.

FIG. 1

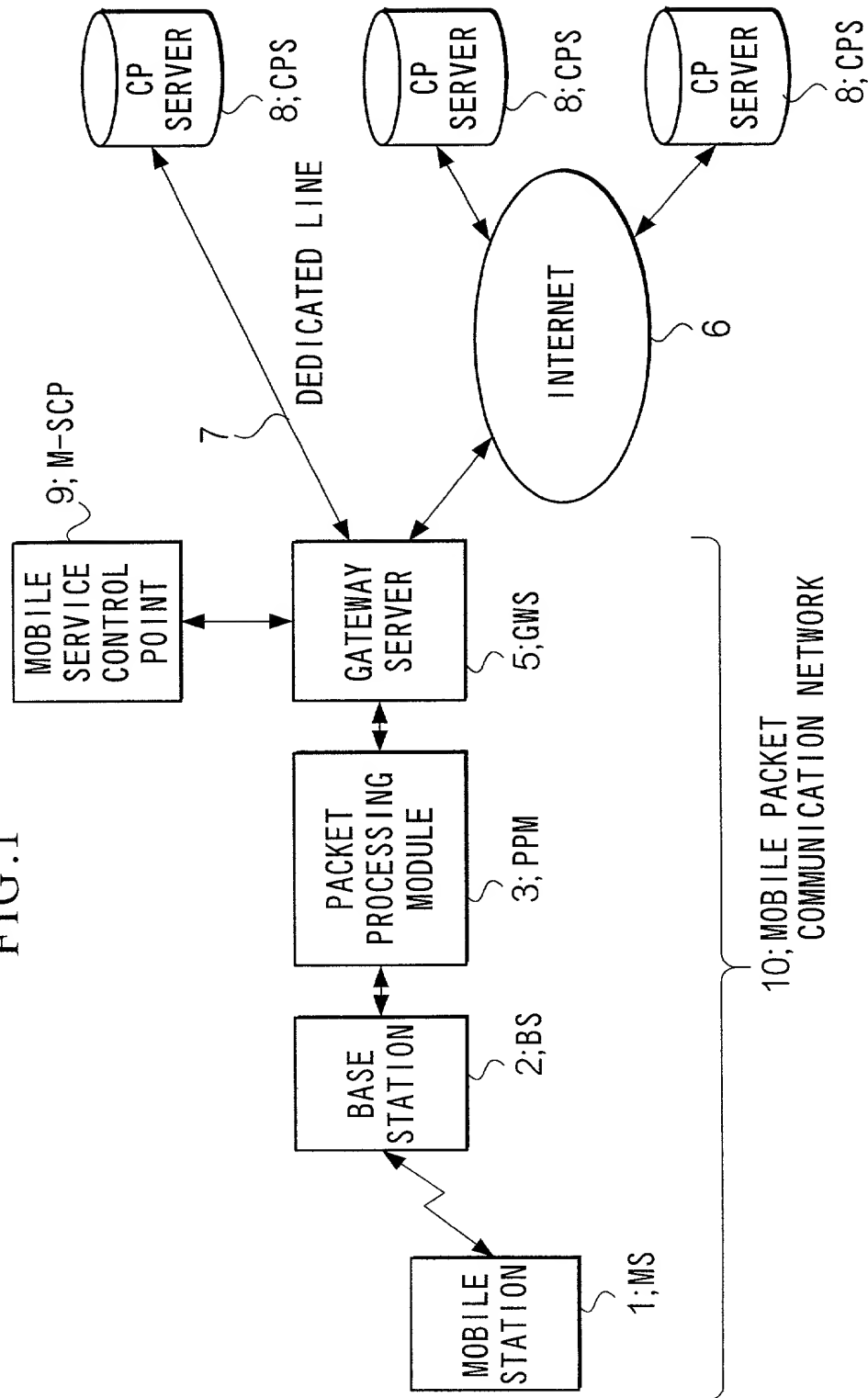
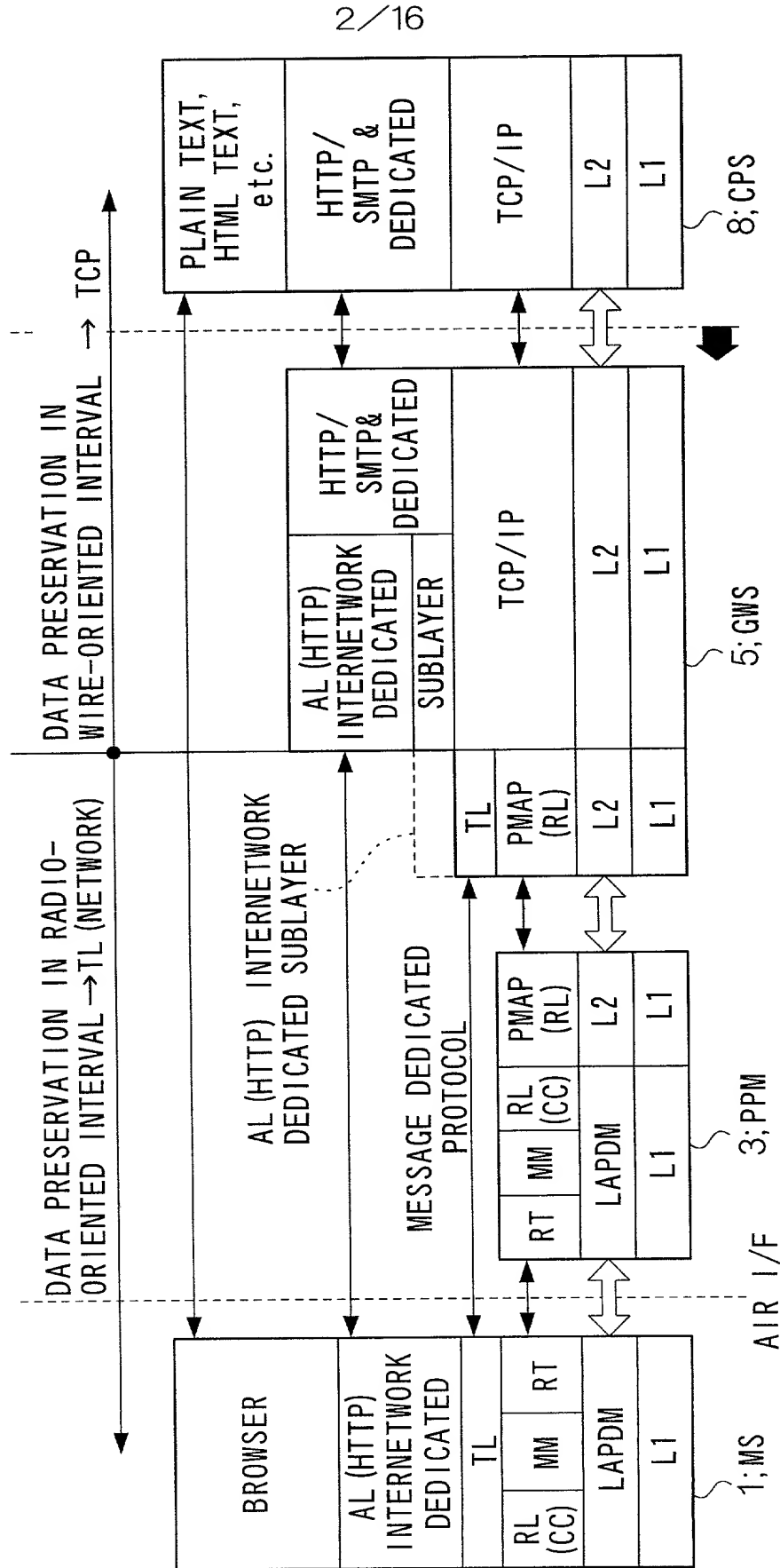


FIG. 2



3/16

FIG. 3

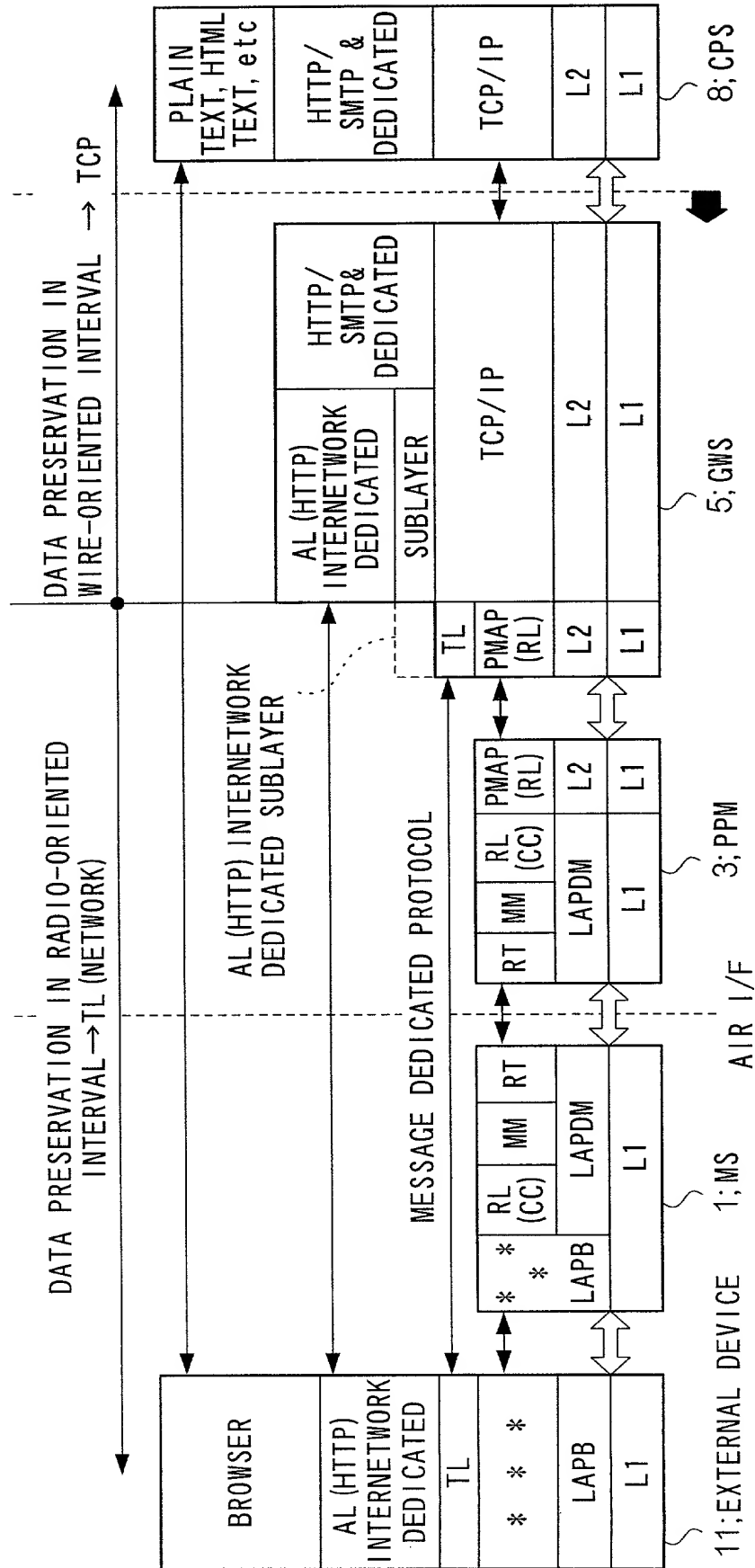
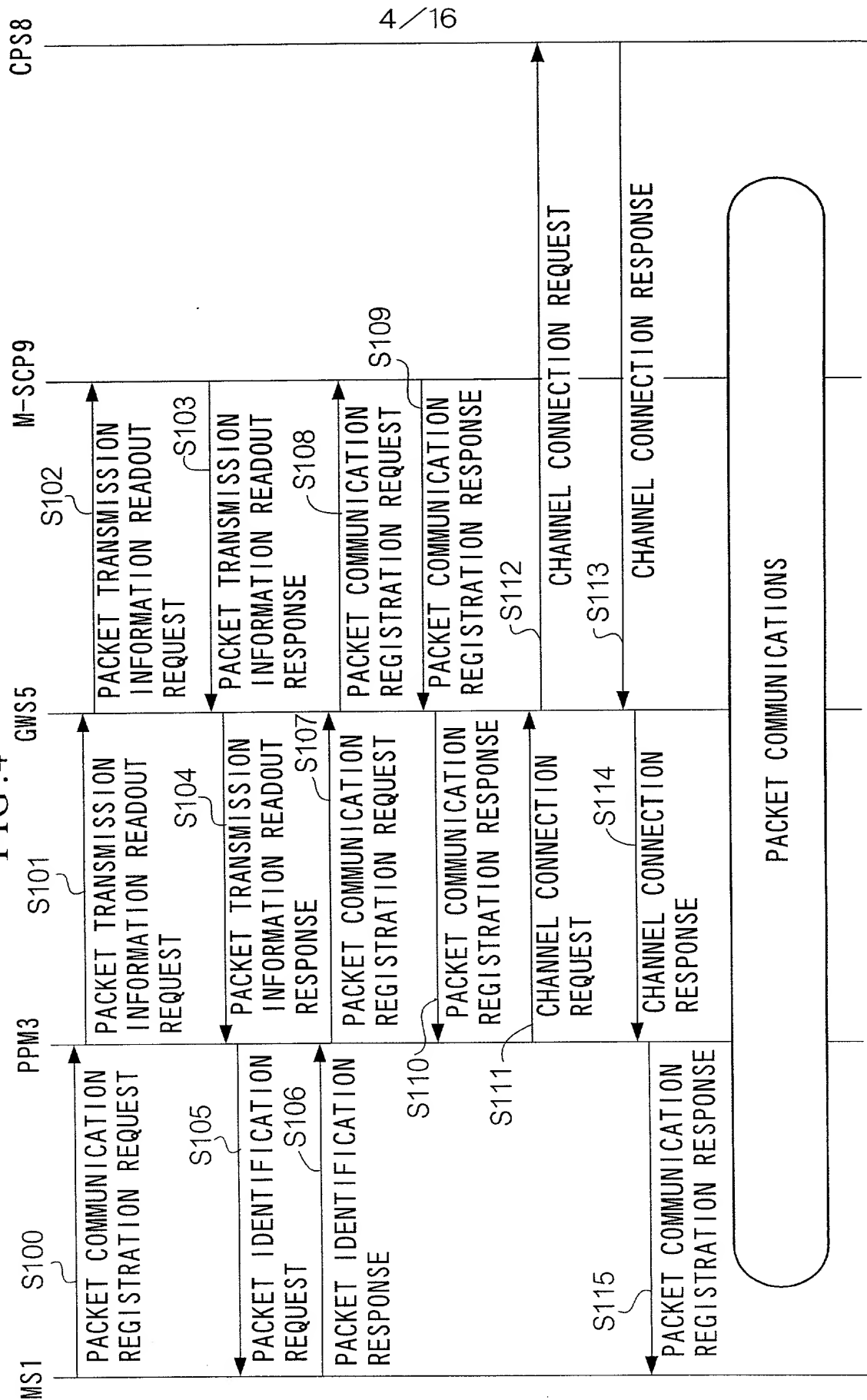
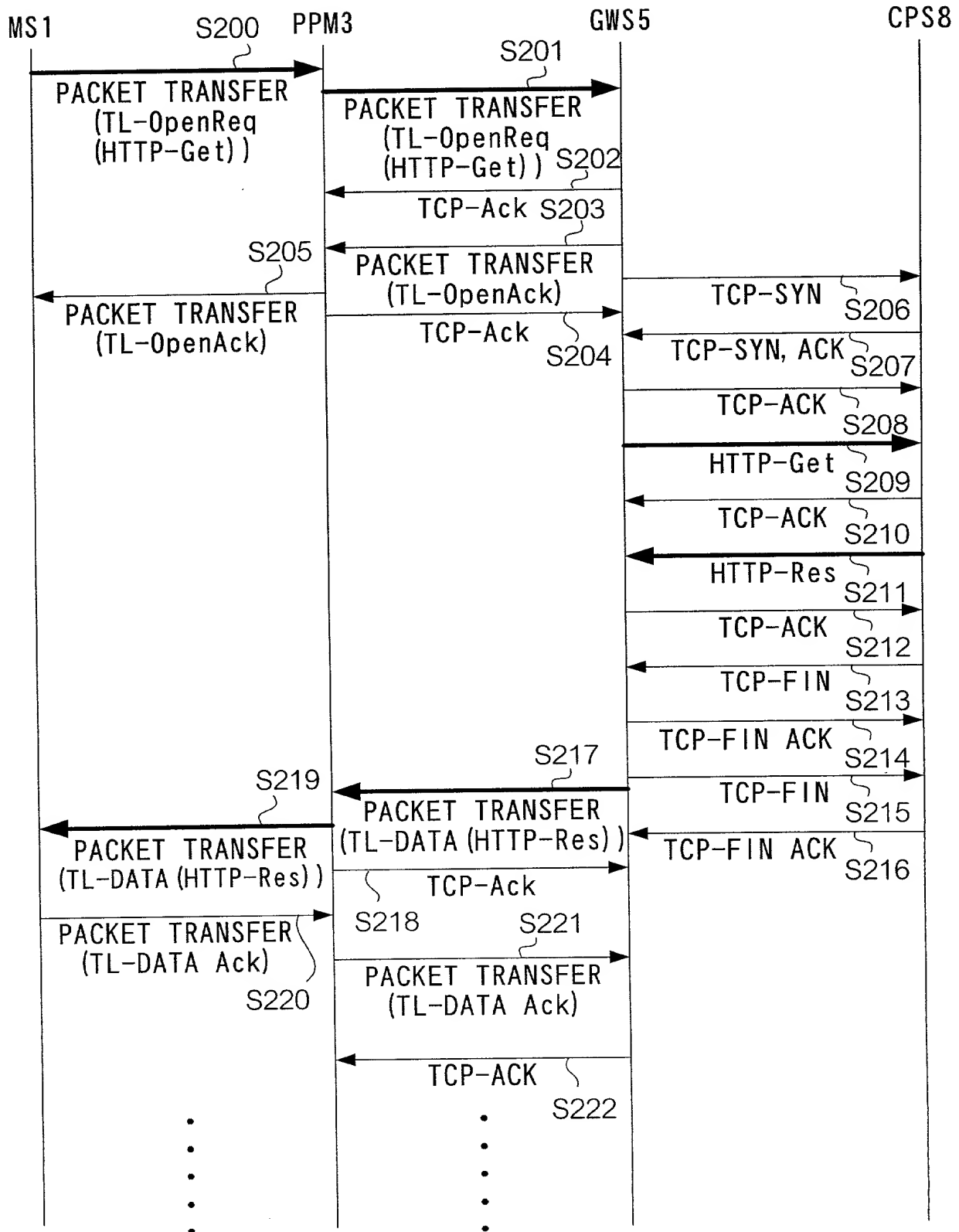


FIG. 4



5/16

FIG. 5



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sequenceDiagram
    participant MS1
    participant PPM3
    participant GWS5
    participant MSCP9 as M-SCP9
    participant CPS8

    Note over MS1, PPM3: PACKET COMMUNICATIONS
    MS1->>PPM3: S300 PACKET COMMUNICATION DEREGISTRATION REQUEST
    PPM3->>GWS5: S301 PACKET COMMUNICATION DEREGISTRATION REQUEST
    GWS5->>MSCP9: S302 PACKET COMMUNICATION DEREGISTRATION REQUEST
    MSCP9->>CPS8: S303 PACKET COMMUNICATION DEREGISTRATION REQUEST
    CPS8->>MSCP9: S304 PACKET COMMUNICATION DEREGISTRATION RESPONSE
    MSCP9->>GWS5: S305 PACKET COMMUNICATION DEREGISTRATION RESPONSE
    GWS5->>PPM3: S306 PACKET COMMUNICATION DEREGISTRATION ACKNOWLEDGMENT
    PPM3->>MS1: S307 CHANNEL DISCONNECTION REQUEST
    MS1->>PPM3: S308 CHANNEL DISCONNECTION RESPONSE
    PPM3->>GWS5: S309 CHANNEL DISCONNECTION REQUEST
    GWS5->>MSCP9: S310 CHANNEL DISCONNECTION RESPONSE
    
```

The diagram illustrates the Packet Communication Derogation Request and Response process across five entities: MS1, PPM3, GWS5, M-SCP9, and CPS8. The process is divided into two main phases: PACKET COMMUNICATIONS and CHANNEL DISCONNECTION. The sequence of messages is as follows:

- PACKET COMMUNICATIONS:**
 - MS1 sends S300 (PACKET COMMUNICATION DEREGISTRATION REQUEST) to PPM3.
 - PPM3 sends S301 (PACKET COMMUNICATION DEREGISTRATION REQUEST) to GWS5.
 - GWS5 sends S302 (PACKET COMMUNICATION DEREGISTRATION REQUEST) to M-SCP9.
 - M-SCP9 sends S303 (PACKET COMMUNICATION DEREGISTRATION REQUEST) to CPS8.
 - CPS8 sends S304 (PACKET COMMUNICATION DEREGISTRATION RESPONSE) to M-SCP9.
 - M-SCP9 sends S305 (PACKET COMMUNICATION DEREGISTRATION RESPONSE) to GWS5.
 - GWS5 sends S306 (PACKET COMMUNICATION DEREGISTRATION ACKNOWLEDGMENT) to PPM3.
- CHANNEL DISCONNECTION:**
 - PPM3 sends S307 (CHANNEL DISCONNECTION REQUEST) to MS1.
 - MS1 sends S308 (CHANNEL DISCONNECTION RESPONSE) to PPM3.
 - PPM3 sends S309 (CHANNEL DISCONNECTION REQUEST) to GWS5.
 - GWS5 sends S310 (CHANNEL DISCONNECTION RESPONSE) to M-SCP9.

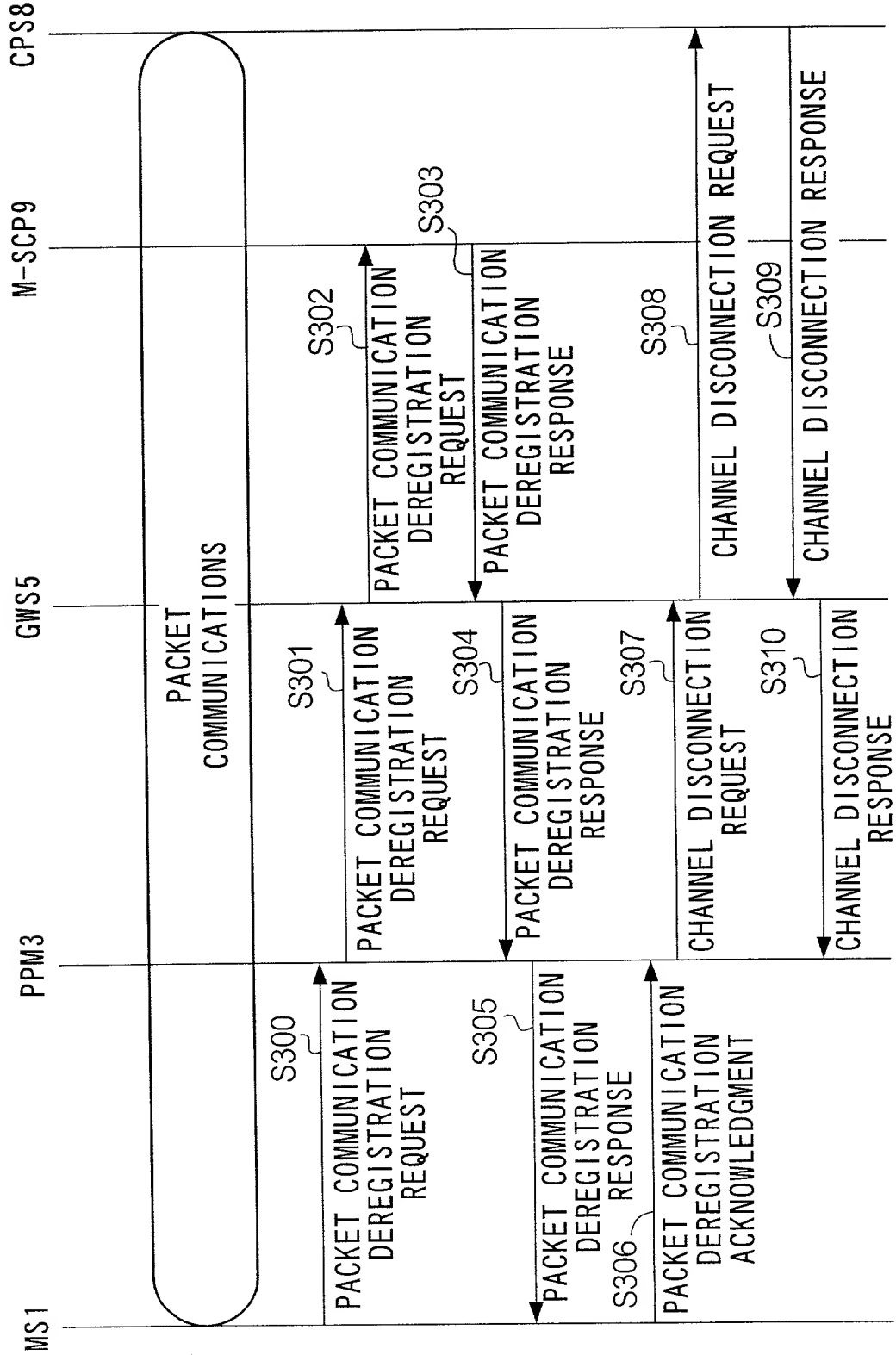
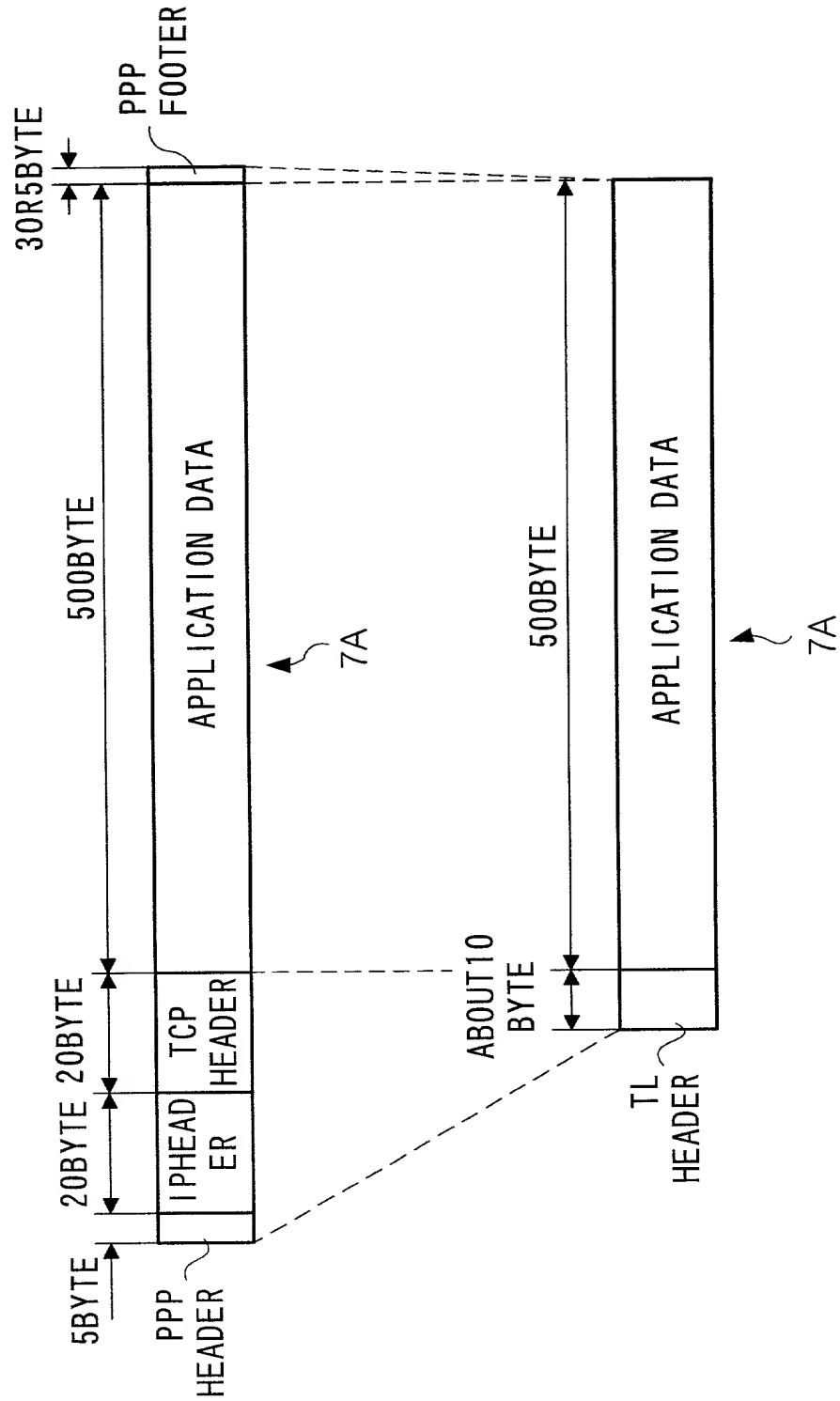
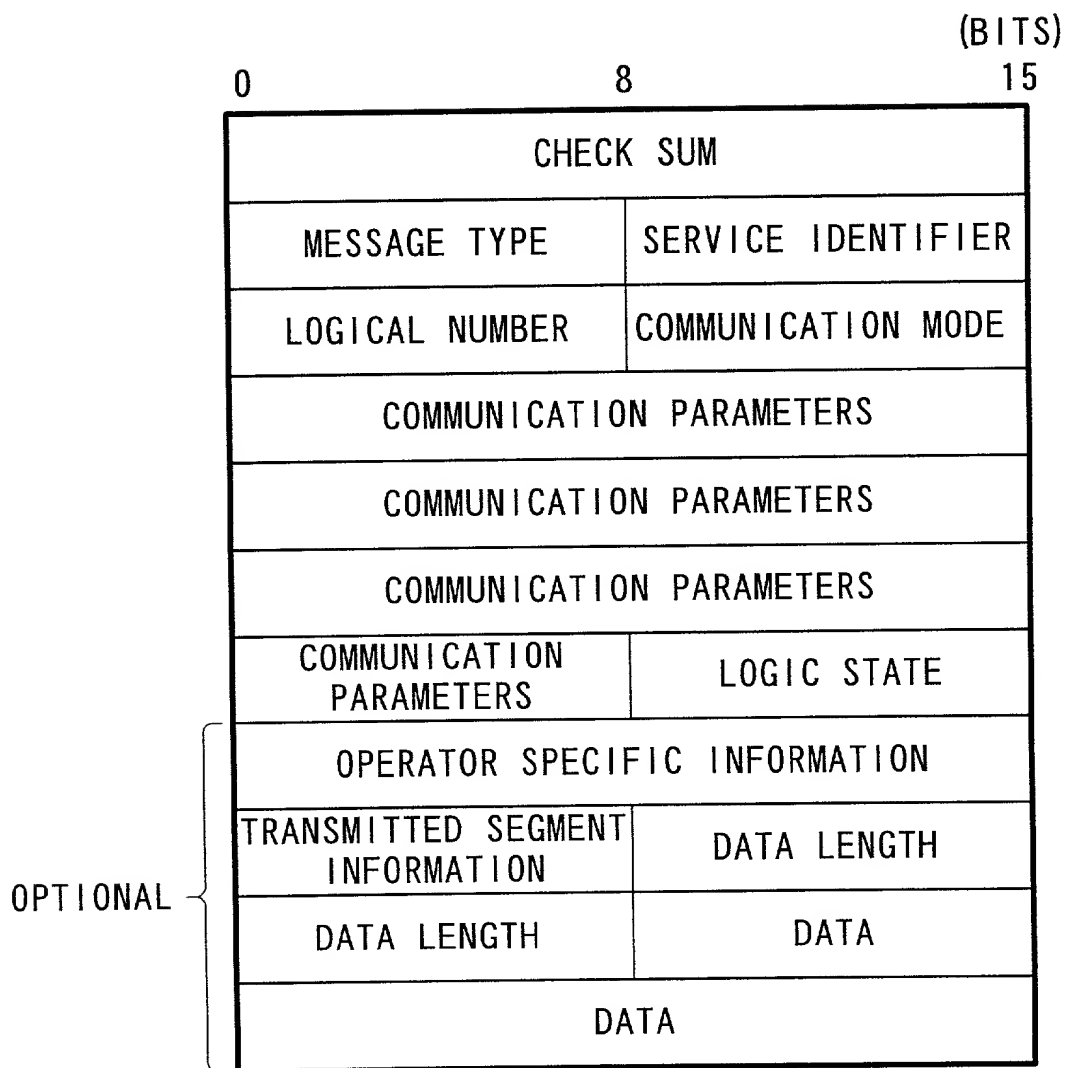


FIG. 7



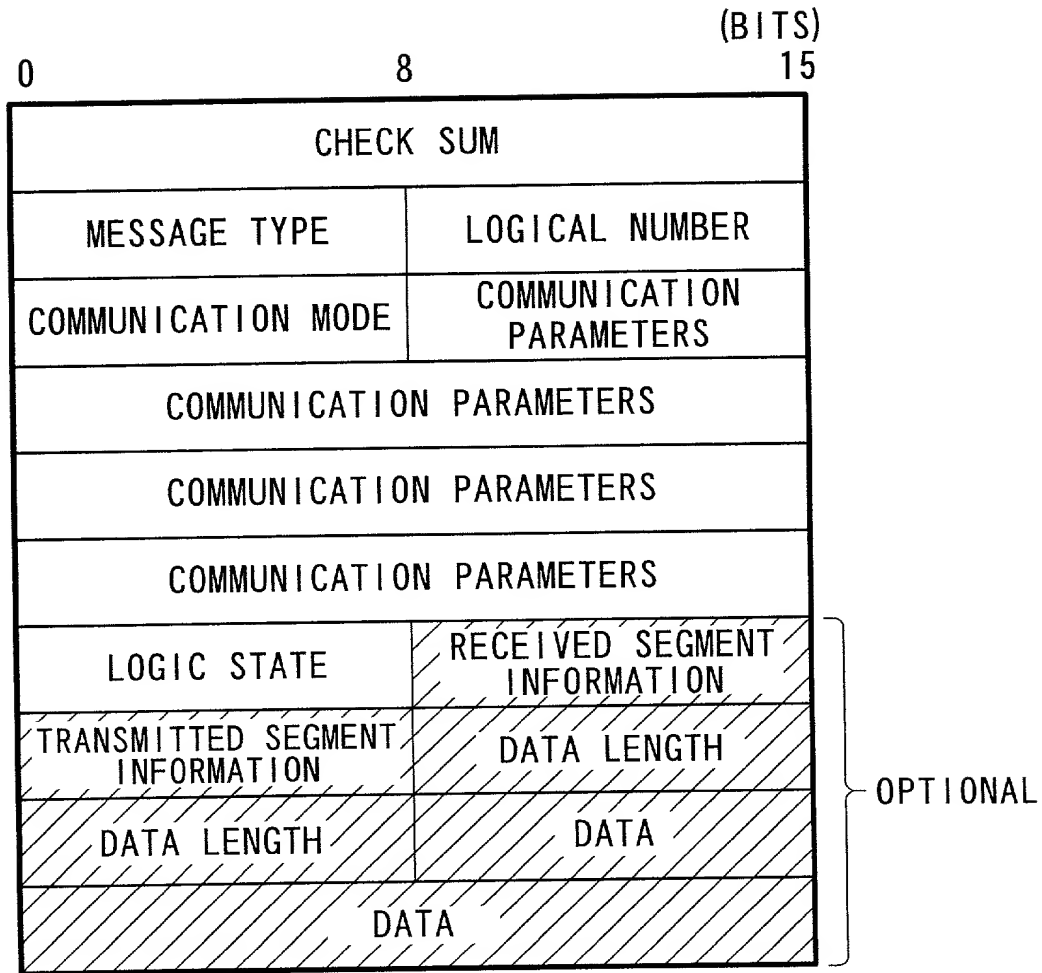
8/16

FIG.8



9/16

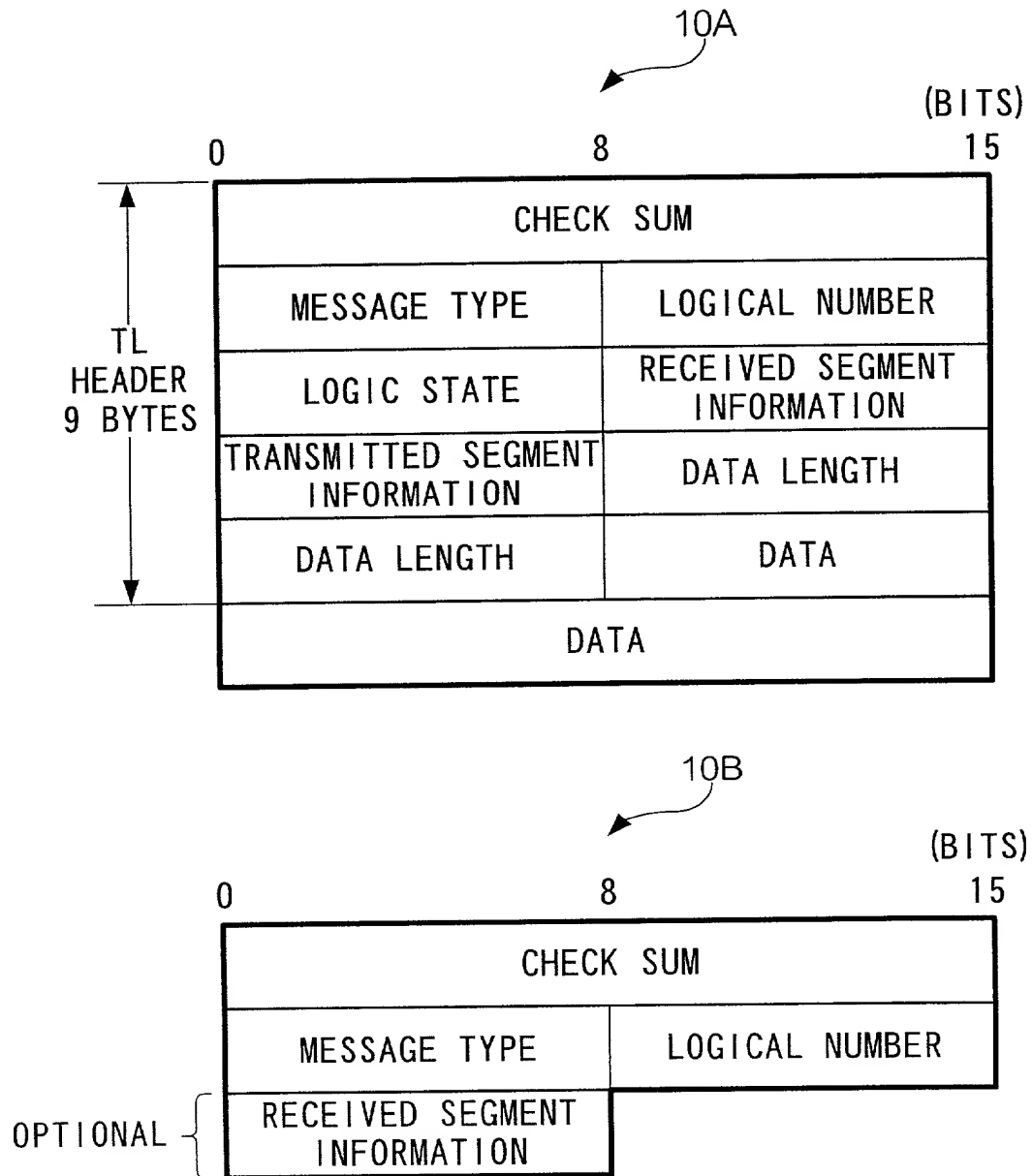
FIG.9



00276/3026 09/600429

10/16

FIG. 10



11/16

FIG.11

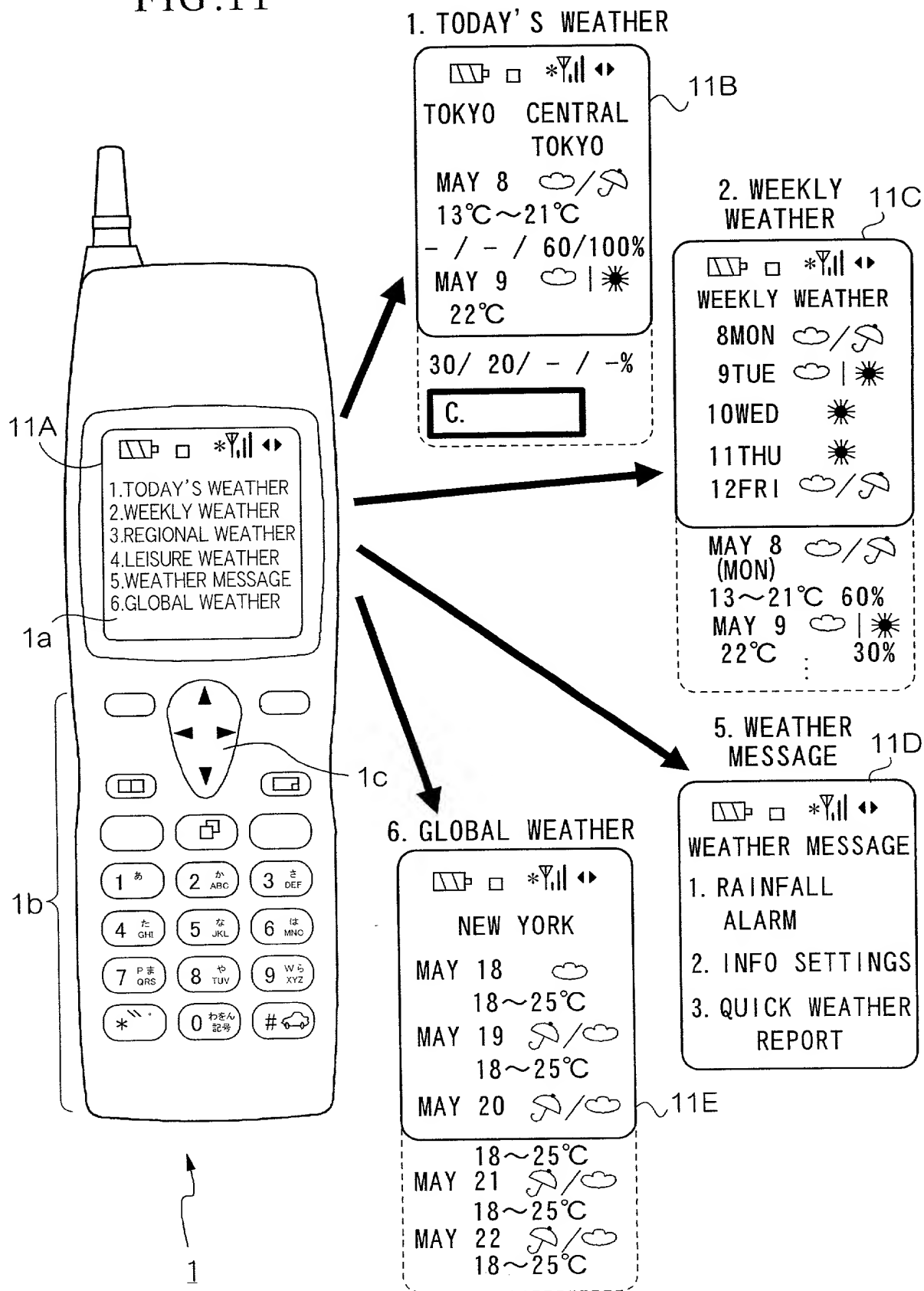
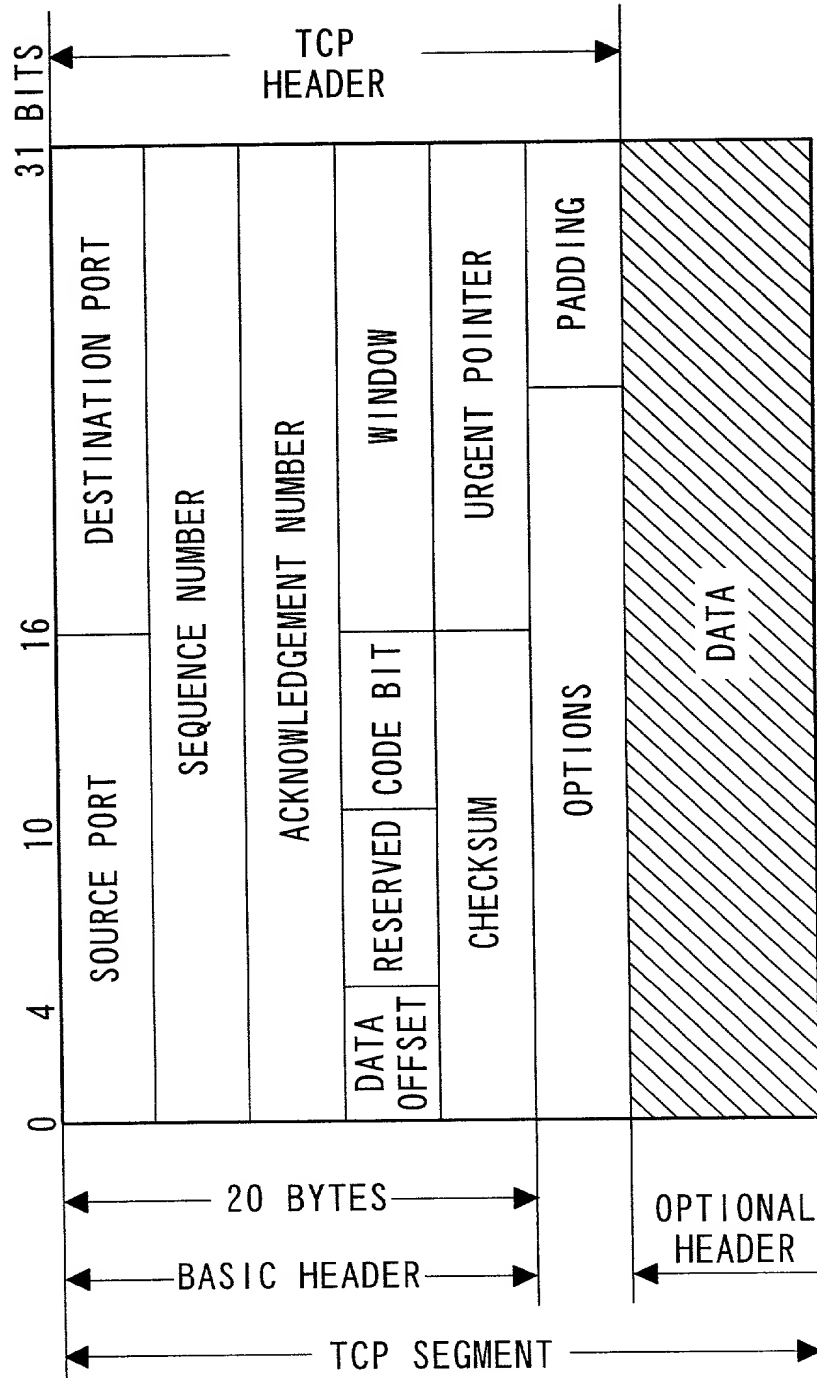


FIG.12



13/16

FIG.13

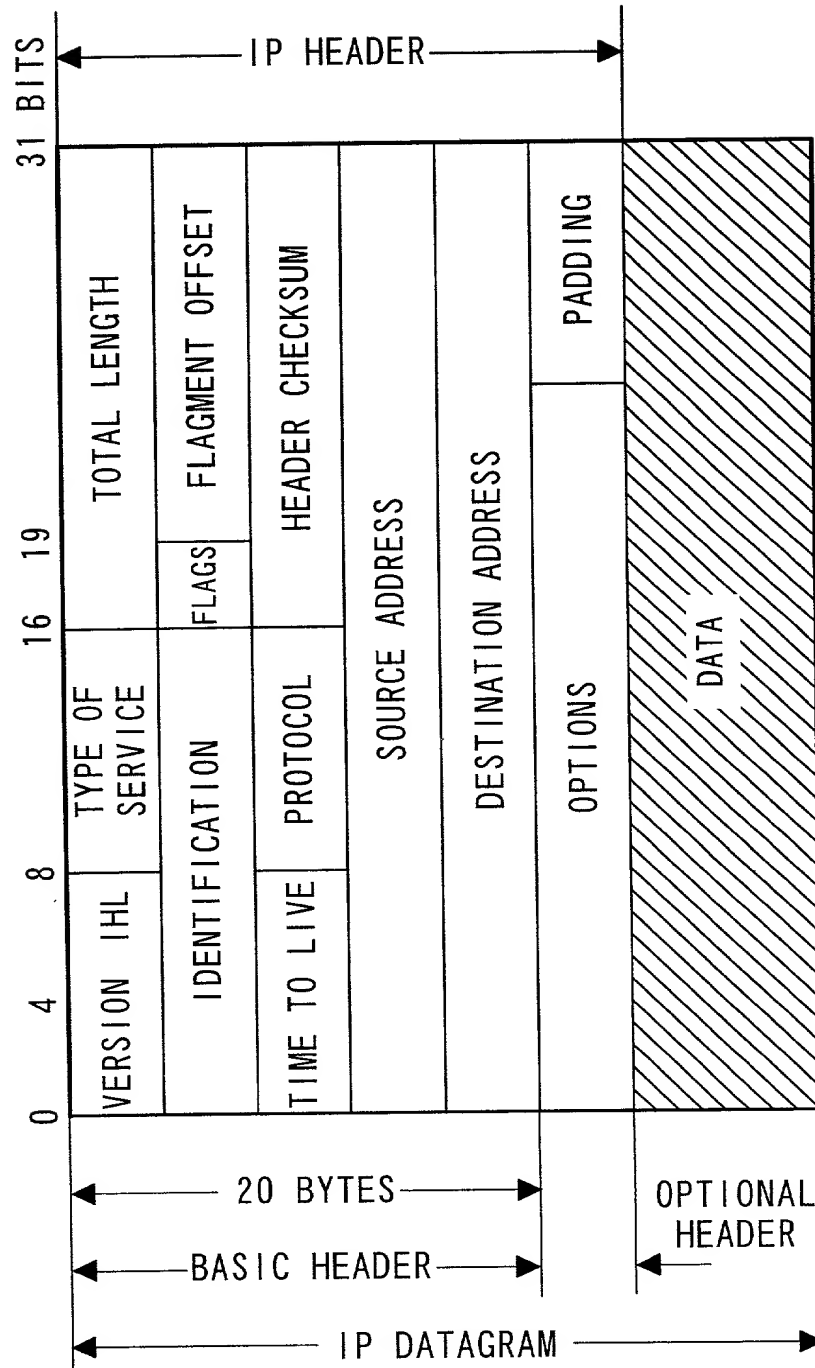
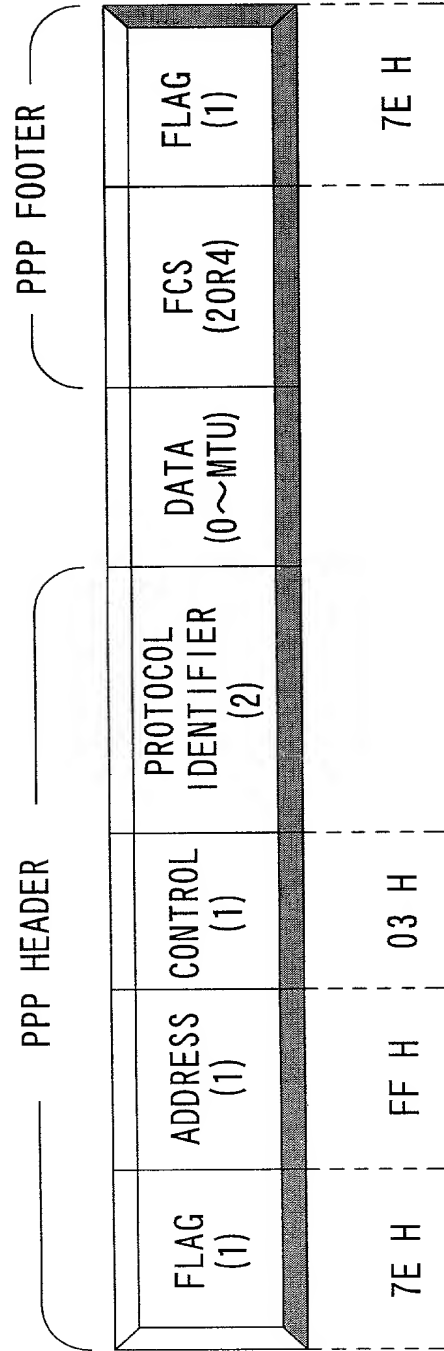


FIG.14



15/16

FIG.15

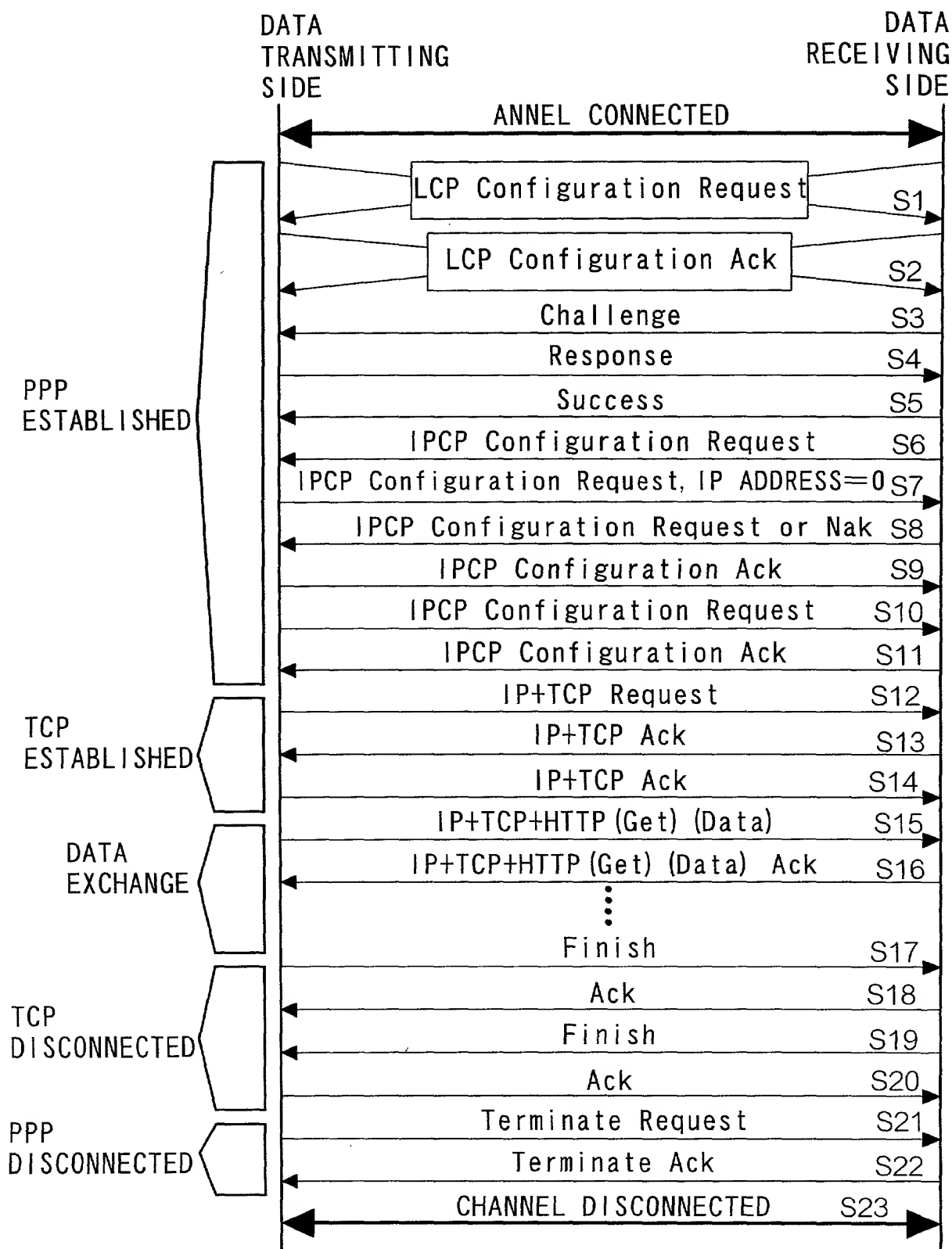
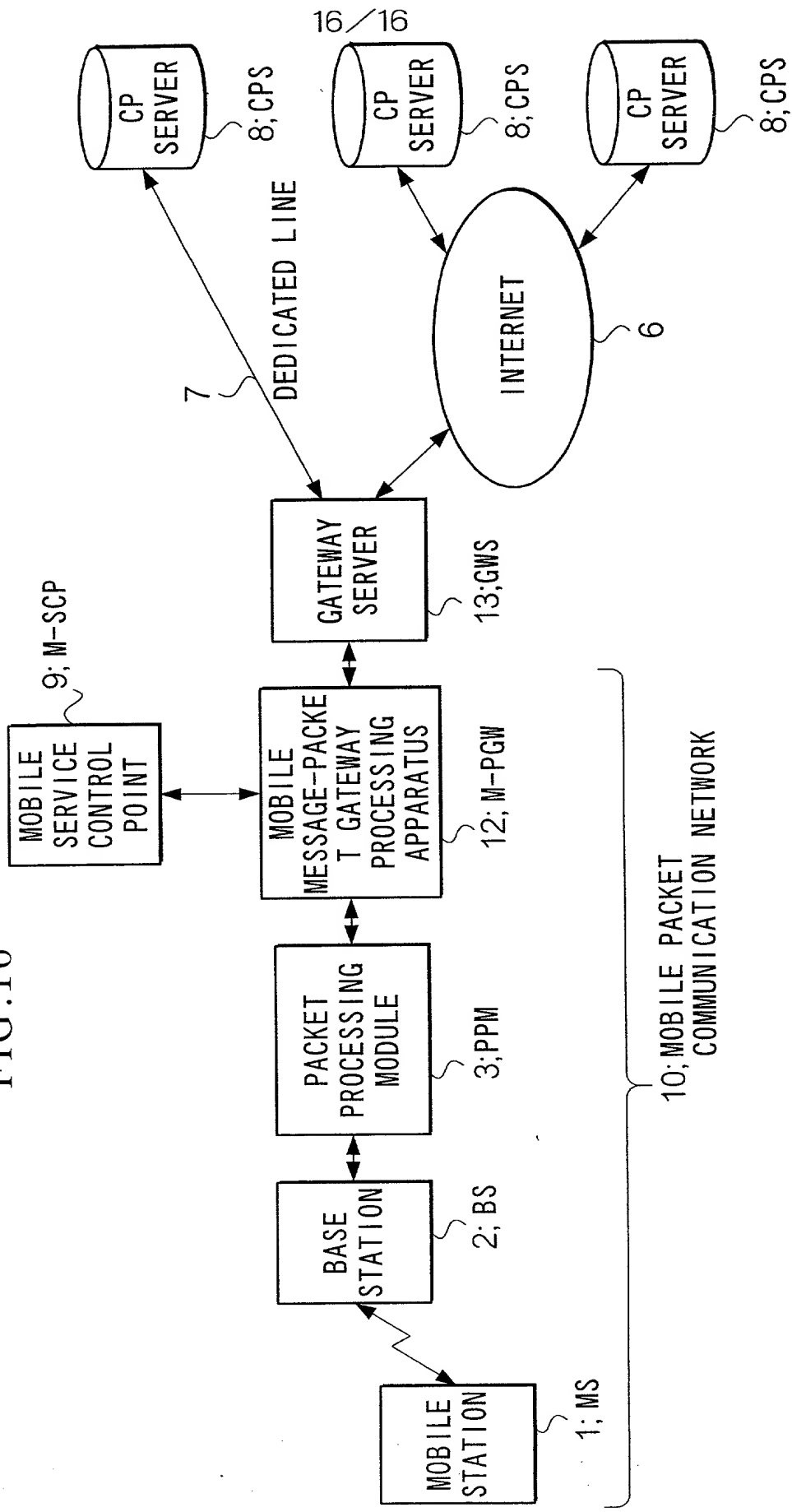


FIG. 16



DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled COMMUNICATION CONTROL METHOD, COMMUNICATION METHOD, SERVER APPARATUS, TERMINAL DEVICE, RELAY APPARATUS AND COMMUNICATION SYSTEM

- ☐ is attached hereto.
☒ was filed on December 24, 1999 as International Application No. PCT/JP99/07281.
☐ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

<u>Prior Foreign Application(s)</u>			<u>Priority Claimed</u>	
<u>Hei 10-374627</u>	<u>Japan</u>	<u>28/12/1998</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

<u>(Application Serial No.)</u>	<u>(Filing Date)</u>
I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:	

<u>(Application Serial No.)</u>	<u>(Filing Date)</u>	<u>None</u> <u>(Status-patented, pending, abandoned)</u>
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.		

7-00
Inventor's Signature
Full name of sole or first inventor
Residence
Citizenship
Post Office Address

Shigetaka Kurita Date: 29.5.2000
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Full name of second inventor
Residence
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Title: COMMUNICATION CONTROL METHOD, COMMUNICATION METHOD, SERVER APPARATUS, TERMINAL DEVICE, RELAY APPARATUS AND COMMUNICATION SYSTEM

POWER OF ATTORNEY

The specification of the above-identified patent application:

- ☐ is attached hereto
☒ was filed on December 24, 1999 as international application No. PCT/JP99/07281

I hereby revoke all previously granted powers of attorney in the above-identified patent application and appoint the following attorneys to prosecute said patent application and to transact all business in the Patent and Trademark Office connected therewith:

3 — Gustavo Siller, Jr. - 32,305
Tadashi D. Horie - 40,437
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The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from _____ as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned.

NTT DoCoMo, Inc., a Japanese Corporation, certifies that it is the assignee of the entire right, title and interest in the patent application identified above by virtue of either:

- ☒ An assignment from the inventor(s) of the patent application identified above, a copy of which is attached hereto.
OR
☐ An assignment from the inventor(s) of the patent application identified above. The assignment was recorded in the Patent and Trademark Office at Reel _____, frame _____.
OR
☐ A chain of title from the inventor(s), of the patent application identified above, to the current assignee as shown below:

1. From _____ To: _____
The document was recorded in the Patent and Trademark Office at Reel _____, frame _____, or a copy thereof is attached.
2. From _____ To: _____
The document was recorded in the Patent and Trademark Office at Reel _____, frame _____, or a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet.

The undersigned has reviewed the assignment or all the documents in the chain of title of the patent application identified above and, to the best of undersigned's knowledge and belief, title is in the assignee identified above.

The undersigned (whose title is supplied below) is empowered to act on behalf of the assignee.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature: Yoshitaro Shimanuki Date: June 6, 2000
Name: Yoshitaro Shimanuki
Title: Executive Manager
Intellectual Property Department